

WHAT IS CLAIMED IS:

1. A method of manufacturing a semiconductor device, comprising the steps of:

providing a conductive flat substrate,

fixing semiconductor elements respectively to plural predetermined parts of a principal surface of said substrate,

electrically connecting electrodes on the surface of said semiconductor elements with predetermined partition parts of said substrate around said semiconductor element by conductive wires, respectively,

forming an insulating resin layer on a principal surface of said substrate to cover said semiconductor elements and said wires,

selectively removing said substrate from the rear of said substrate to form electrically independent partition parts whereof at least some are external electrode terminals, and

selectively removing said resin layer to fragment said device into regions containing said semiconductor elements and said plural partition parts around said semiconductor elements.

2. The method of manufacturing a semiconductor device according to Claim 1, wherein said partition parts are formed by selectively removing said substrate to provide a checkered

pattern of grooves in said substrate which divide said substrate.

3. The method of manufacturing a semiconductor device according to Claim 2, wherein said grooves are formed also at the rear of the substrate region where said semiconductor elements were fixed.

4. The method of manufacturing a semiconductor device according to Claim 1, wherein said semiconductor elements are fixed to said substrate by an insulating adhesive.

5. The method of manufacturing a semiconductor device according to Claim 1, wherein, in the step which selectively removes said substrate, the substrate in the region where said semiconductor elements were fixed, is not removed.

6. The method of manufacturing a semiconductor device according to Claim 1, wherein said fragmentation is performed by splitting said resin layer into regions comprising plural semiconductor elements and plural external electrode terminals.

7. The method of manufacturing a semiconductor device according to Claim 1, wherein the selective removal of said substrate is performed by etching.

8. The method of manufacturing a semiconductor device according to Claim 1, wherein the selective removal of said substrate is performed by cutting by means of dicing.

9. The method of manufacturing a semiconductor device according to Claim 1, wherein the selective removal of said substrate is performed by melt cutting by means of laser beam irradiation.

10. The method of manufacturing a semiconductor device according to Claim 1, wherein, after forming the resin layer on the principal surface of said substrate, a tape is affixed to the surface of said resin layer, said partition parts are formed and said fragmentation is performed, and the tape is then peeled off.

11. The method of manufacturing a semiconductor device according to Claim 1, wherein said fragmentation is performed by cutting by means of dicing.

12. The method of manufacturing a semiconductor device according to Claim 1, wherein said fragmentation is performed by melt cutting by means of laser beam irradiation.

13. The method of manufacturing a semiconductor device according to Claim 1, wherein said resin layer is formed by transfer molding.

14. The method of manufacturing a semiconductor device according to Claim 1 wherein, after electrically connecting, by means of conductive wires, regions which function as said external electrode terminals separate from the region wherein said semiconductor elements are fixed, to the predetermined partition parts wherein said semiconductor elements are fixed, the semiconductor elements are fixed to the substrate by insulating adhesive to enclose a part of said wires and form said external electrode terminals also underneath said semiconductor elements.

15. The method of manufacturing a semiconductor device according to Claim 14, wherein the partition parts underneath the semiconductor elements to which said wires are connected, and other partition parts underneath said semiconductor elements, are connected by conductive wires.

16. The method of manufacturing a semiconductor device according to Claim 1, wherein the selective removal of said substrate is brought up to the surface of said resin layer.

17. The method of manufacturing a semiconductor device according to Claim 1, wherein the selective removal of said substrate is performed so that the adhesive which fixes said semiconductor elements to said substrate is not penetrated.

18. The method of manufacturing a semiconductor device according to Claim 1, wherein a bonding strength enhancement is given to a principal surface of said substrate so that the principal surface of said substrate bonds firmly to said resin layer.

19. The method of manufacturing a semiconductor device according to Claim 1, wherein two or more rows of said external electrode terminals are arranged along an edge of said resin layer.

20. The method of manufacturing a semiconductor device according to Claim 2, wherein through holes are provided at intersection points which divide said substrate transversely and longitudinally.

21. A method of manufacturing a semiconductor device,
comprising the steps of:

forming plural, mutually independent partition parts
by providing plural grooves on one surface of a flat
conductive substrate so that plural unit substrate parts are
formed by the plural partition parts,

fixing semiconductor elements to predetermined
positions of the unit substrate parts on a surface of said
substrate where said grooves are present and a surface of
said substrate where said grooves are not present,

electrically connecting, by means of conductive wires,
electrodes on the surfaces of said semiconductor elements
with predetermined partition parts or rear surface regions of
said partition parts of the unit substrate parts to which
said semiconductor elements are fixed,

forming an insulating resin layer over effectively the
whole region of the substrate surface to which said
semiconductor elements and said wires are connected so as to
cover said semiconductor elements and said wires,

removing the substrate parts of the groove bases to
electrically isolate said partition parts, so that at least
some of the partition parts form external electrode terminals
which are regions to which said wires are connected, and

selectively removing said resin layer to perform
fragmentation into said unit substrate parts.

22. The method of manufacturing a semiconductor device according to Claim 21, wherein said partition parts are formed by providing a checkered pattern of said grooves on said substrate surface.

23. The method of manufacturing a semiconductor device according to Claim 21, wherein said grooves are provided also in the substrate region in which said semiconductor elements are fixed or a rear surface region of the substrate region in which said semiconductor elements are fixed.

24. The method of manufacturing a semiconductor device according to Claim 21, wherein said semiconductor elements are fixed to said substrate by an insulating adhesive.

25. The method of manufacturing a semiconductor device according to Claim 21, wherein said semiconductor elements are fixed to a single partition part by selectively forming a pattern of said grooves.

26. The method of manufacturing a semiconductor device according to Claim 21, wherein, in the manufacturing method wherein semiconductor elements are fixed to a surface in which said grooves are not present, the rear surface side of said substrate is removed by etching to a predetermined

thickness so that the thickness of the substrate of said partition part which supports the middle parts of said semiconductor elements is thinner than the thickness of the substrate of said partition part which supports the peripheral part of said semiconductor elements.

27. The method of manufacturing a semiconductor device according to Claim 21, wherein the peripheral parts of said semiconductor elements are supported by some of said partition parts, and through holes are formed in said unit substrate parts so that the partition parts are not present in the middle parts of said semiconductor elements.

28. The method of manufacturing a semiconductor device according to Claim 21, wherein in removing said groove bases, said grooves are selected to electrically isolate each of said plural partition parts.

29. The method of manufacturing a semiconductor device according to Claim 21, wherein said fragmentation is performed by dividing said resin layer into regions comprising said plural semiconductor elements and plural external electrode terminals.

30. The method of manufacturing a semiconductor device according to Claim 21, wherein the removal of said groove bases for electrically isolating said partition parts is performed by any of etching, dicing and laser beam irradiation.

31. The method of manufacturing a semiconductor device according to Claim 21, wherein, in the manufacture of the semiconductor device which fixes semiconductor elements to the surface where grooves are present, the removal of said groove bases for electrically isolating said partition parts is performed by polishing the surface where grooves are not present to a predetermined thickness.

32. The method of manufacturing a semiconductor device according to Claim 21, wherein, after forming a resin layer on a principal surface of said substrate, a tape is affixed to the surface of said resin layer, said partition parts are formed and fragmentation is performed, and the tape is then peeled off.

33. The method of manufacturing a semiconductor device according to Claim 21, wherein said fragmentation is performed by dicing or laser beam irradiation.

34. The method of manufacturing a semiconductor device according to Claim 21, wherein said resin layer is formed by transfer molding.

35. The method of manufacturing a semiconductor device according to Claim 21 wherein, on the side where the semiconductor elements of said substrate are fixed, regions which are external electrode terminals separate from the region where said semiconductor elements are fixed, and said partition parts adjacent to these external electrodes to which said semiconductor elements are fixed, are connected by conductive wires or substrate parts so as to form external electrode terminals also underneath said semiconductor elements.

36. The method of manufacturing a semiconductor device according to Claim 21 wherein, when the groove bases are removed, the front surfaces of said semiconductor elements are not removed.

37. The method of manufacturing a semiconductor device according to Claim 21, wherein a bonding strength enhancement is applied to the principal surface of said substrate such that the principal surface of said substrate is strongly bonded to said resin layer.

38. The method of manufacturing a semiconductor device according to Claim 21, wherein said external electrode terminals are arranged in two or more rows along an edge of said resin layer.

39. The method of manufacturing a semiconductor device according to Claim 21, wherein through holes are provided at intersection points which divide said substrate transversely and longitudinally.

40. The method of manufacturing a semiconductor device according to Claim 21, wherein said semiconductor elements are fixed to said substrate so that one side of said semiconductor elements intersects with said grooves.

41. The method of manufacturing a semiconductor device according to Claim 21, wherein, in the method of manufacturing a semiconductor device in which said semiconductor elements are fixed to the surface in which grooves are not present, the groove bases are removed by cutting with a dicing blade having a larger width than the groove width or a dicing blade having a narrower width than the groove width.

42. The method of manufacturing a semiconductor device according to Claim 21, wherein, in the method of manufacturing a semiconductor device in which said semiconductor elements are fixed to the surface in which grooves are present, said grooves in the region where said semiconductor elements are fixed, are filled with a filling substance, and said semiconductor elements are then fixed to said substrate using said adhesive such that there is no gap between said semiconductor elements and said substrate.

43. The method of manufacturing a semiconductor device according to Claim 1, wherein said plural grooves are provided facing each other on the front and rear surfaces of the flat substrate.

44. The method of manufacturing a semiconductor device according to Claim 43, wherein, in the step for selectively removing said substrate, the bases of said facing grooves are removed from the rear surface of said substrate so as to electrically isolate said partition parts.

45. A method of manufacturing a semiconductor device, comprising the steps of:

providing a conductive substrate having plural unit substrate parts, said plural unit substrate parts

respectively comprising rectangular tabs and plural leads connected via said tabs which respectively comprise plural wire connecting regions,

fixing semiconductor elements respectively to said tabs on the principal surface side of said substrate via an adhesive,

electrically connecting the electrodes on the front surfaces of said semiconductor elements and said predetermined wire connecting regions of said leads respectively by conductive wires,

forming an insulating resin layer on the principal surface of said substrate to cover said semiconductor elements and said wires,

selectively removing said leads over the whole length of the lead width to electrically isolate said tabs, leads of adjacent unit substrate parts and adjacent wire connecting regions so as to form external electrode terminals, and

selectively removing said resin layer to fragment it into unit substrate regions comprising said unit substrate parts.

46. The method of manufacturing a semiconductor device according to Claim 45, wherein after forming the resin layer on the principal surface of said substrate, a tape is affixed to the whole of the front surface of said resin layer, said

leads are selectively removed and said fragmentation is performed, and the tape is then peeled off.

47. The method of manufacturing a semiconductor device according to Claim 45, wherein said unit substrate regions are aligned in the transverse and longitudinal directions of said substrate.

48. The method of manufacturing a semiconductor device according to Claim 45, wherein said semiconductor elements are connected over part of the leads which extend from said tabs.

49. The method of manufacturing a semiconductor device according to Claim 45, wherein the middles of said leads are curved one step higher so that said tabs are one step higher than the lead surfaces, said semiconductor elements are fixed to said high tab surfaces, and a resin layer is formed also underneath said tabs and when said resin layer is formed.

50. The method of manufacturing a semiconductor device according to Claim 45, wherein the selective removal of said leads is performed by any of etching , dicing and laser beam irradiation.

51. The method of manufacturing a semiconductor device according to Claim 45, wherein said fragmentation is performed by cutting by means of dicing.

52. The method of manufacturing a semiconductor device according to Claim 45, wherein said resin layer is formed by transfer molding.

53. The method of manufacturing a semiconductor device according to Claim 52, wherein transfer molding is performed by bonding tab surfaces to which said semiconductor elements of said substrate are not fixed, to a mold die surface by vacuum suction.

54. The method of manufacturing a semiconductor device according to Claim 52, wherein the selective removal of the said leads is brought up to the surface layer of the resin layer.

55. The method of manufacturing a semiconductor device according to Claim 45, wherein said external electrode terminals are arranged in two or more rows along an edge of said resin layer.

56. The method of manufacturing a semiconductor device according to Claim 45, wherein the tab surfaces to which said semiconductor elements are not fixed are formed thinner than said leads by etching to a predetermined thickness, and when said resin layer is formed, the resin layer is formed also on the tab surfaces to which said semiconductor elements are not fixed.

57. The method of manufacturing a semiconductor device according to Claim 45, wherein, when said conductive substrate is patterned,

both edges are joined via said substrate frame or said leads in an extension region in the corner direction of said tabs in the unit substrate regions or said tabs, directly or via supporting pieces, and plural corner leads are formed having plural wire connecting regions in its length direction,

the wires connected to the electrode of the semiconductor elements are connected also to the wire connecting regions of said corner leads, and

wherein when the leads are selectively removed, the wire connecting regions of the corner leads are cut and said supporting pieces are removed.

58. The method of manufacturing a semiconductor device according to Claim 45, wherein the parts of said leads which

are selectively removed are situated on straight lines running in the transverse and longitudinal directions of said substrate, and removed by dicing.

59. The method of manufacturing a semiconductor device according to Claim 57, wherein the parts of said leads which are selectively removed and said supporting pieces are situated on straight lines running in the transverse and longitudinal directions of said substrate.

60. The method of manufacturing a semiconductor device according to Claim 45, wherein, when said leads are selectively removed, the front surfaces of said semiconductor elements are not removed.

61. The method of manufacturing a semiconductor device according to Claim 45, wherein bonding strength enhancement is applied to the adhesive surfaces of the remaining leads such that the bonding between the remaining lead parts connected to the resin layer and said resin layer, is enhanced.

62. A method of manufacturing a semiconductor device, comprising the steps of:

providing a conductive substrate having plural grooves formed in one surface, plural partition parts separated by said grooves and unit substrate parts formed by said plural partition parts,

fixing semiconductor elements to a predetermined partition part or over plural partition parts of said unit substrate parts,

electrically connecting, by means of conductive wires, the electrodes on the surfaces of said semiconductor elements and said partition parts surrounding said semiconductor elements,

forming an insulating resin layer on one surface of said substrate to which said semiconductor elements and said wires are connected in order to cover said semiconductor elements and said wires,

removing the substrate parts of said groove bases to electrically isolate said partition parts, and in at least some partition parts, form external electrode terminals which are regions wherein said wires are connected,

forming a plating film on the front surfaces of said external electrode terminals projecting from said resin layer so that the front surfaces of said external electrode terminals project more than the front surface of said resin layer, and

selectively remove said resin layer to perform fragmentation into said unit substrate parts.

63. The method of manufacturing a semiconductor device according to Claim 62, wherein said plating film is formed by said plating method.

64. The method of manufacturing a semiconductor device according to Claim 62, wherein the removal of the substrate parts of said groove bases is performed by etching, and said etching is performed so that part of the new substrate front surface exposed by said etching projects further outside than the front surface of said resin layer.

65. The method of manufacturing a semiconductor device according to Claim 62, wherein, when the substrate parts of said groove bases are removed, the frame part comprising the entire circumference of said substrate and said plural partition parts are separated.

66. The method of manufacturing a semiconductor device according to Claim 65, wherein said partition parts are formed by providing said grooves in the transverse and longitudinal directions of said substrate surface, said fragmentation is performed by cutting by the dicing of said

resin layer, and in said cutting step, said substrate is not cut in the outer periphery of said semiconductor device.

67. The method of manufacturing a semiconductor device according to Claim 62, wherein said external electrode terminals are aligned transversely and longitudinally, and the shape of said external electrode terminals is such that the gap between slanting external electrode terminals is larger than the transverse-longitudinal intervals of adjacent external electrode terminals.

68. The method of manufacturing a semiconductor device according to Claim 67, wherein said external electrode terminals are circular.

69. The method of manufacturing a semiconductor device according to Claim 62, wherein said semiconductor elements are fixed to a single partition part wherein the fixing surface is a flat surface, and the rear surface of said partition part is also a flat surface.

70. The method of manufacturing a semiconductor device according to Claim 62, wherein said semiconductor elements are fixed to a single partition part wherein the fixing

surface is a flat surface, and the rear surface of said partition part is hollowed excepting for its edge.

71. The method of manufacturing a semiconductor device according to Claim 62, wherein a direction identifying part is provided on one of the edges of the single partition part to which said semiconductor elements are fixed.

72. The method of manufacturing a semiconductor device according to Claim 62, wherein the single partition part to which said semiconductor elements are fixed, is smaller than said semiconductor elements.

73. The method of manufacturing a semiconductor device according to Claim 62, wherein said semiconductor elements are fixed to said substrate by an insulating adhesive.

74. The method of manufacturing a semiconductor device according to Claim 62, wherein said partition parts to which said semiconductor elements are fixed, is thinner than the other partition parts, and are covered by said resin layer.

75. The method of manufacturing a semiconductor device according to Claim 62, wherein said grooves are grooves formed by wet etching.

76. The method of manufacturing a semiconductor device according to Claim 62, wherein, after forming the resin layer on the principal surface of said substrate, a tape is affixed to the whole surface of said resin layer, said partition parts are formed and fragmentation is performed, and said tape is peeled off.

77. The method of manufacturing a semiconductor device according to Claim 21, wherein said resin layer is formed by transfer molding.

78. The method of manufacturing a semiconductor device according to Claim 62, wherein said external electrode terminals are arranged in two or more rows along an edge of said resin layer.

79. The method of manufacturing a semiconductor device according to Claim 62, wherein plural grooves facing each other are provided on the front and rear surfaces of said flat substrate.

80. The method of manufacturing a semiconductor device according to Claim 79, wherein, in the step for selectively removing the substrate, the bases of said facing grooves is

removed from the rear side of said substrate so as to
electrically isolate said partition parts.